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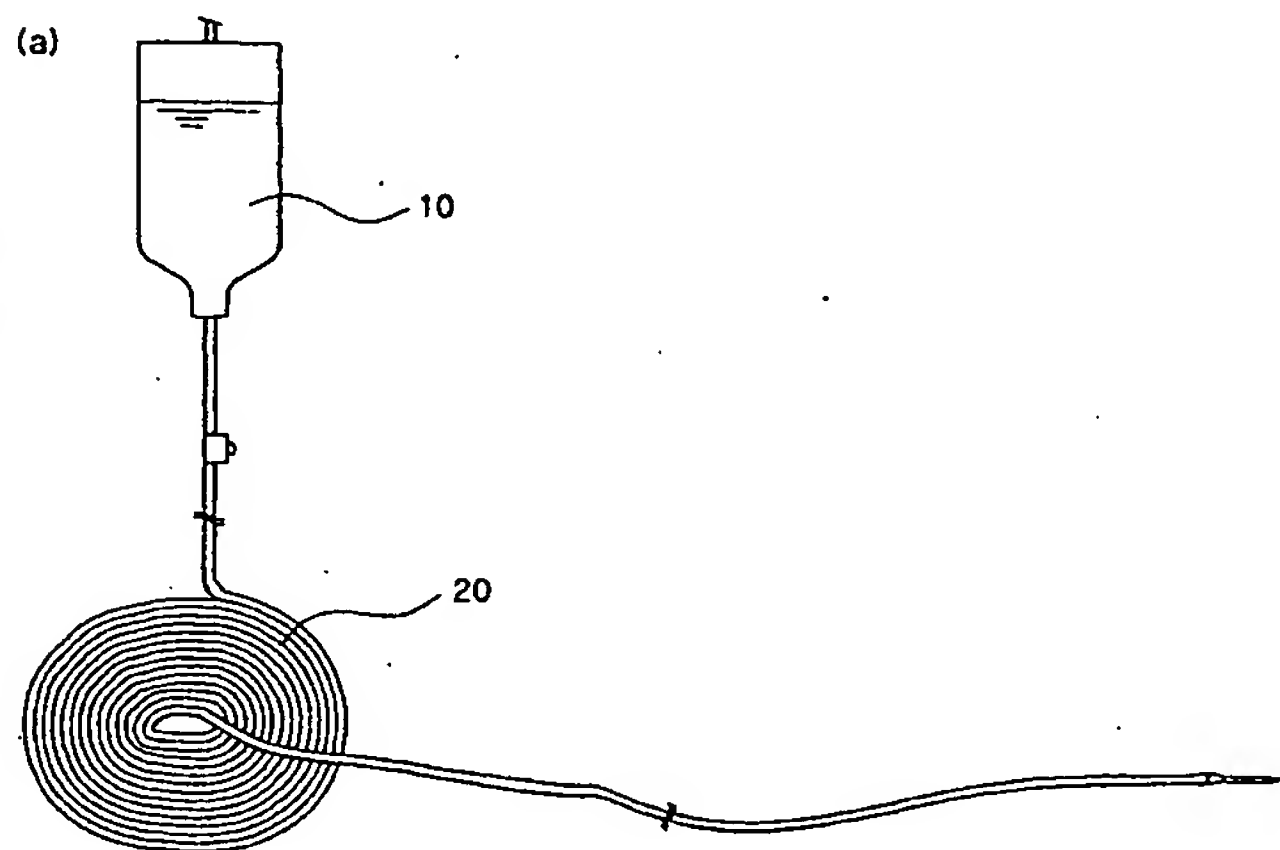
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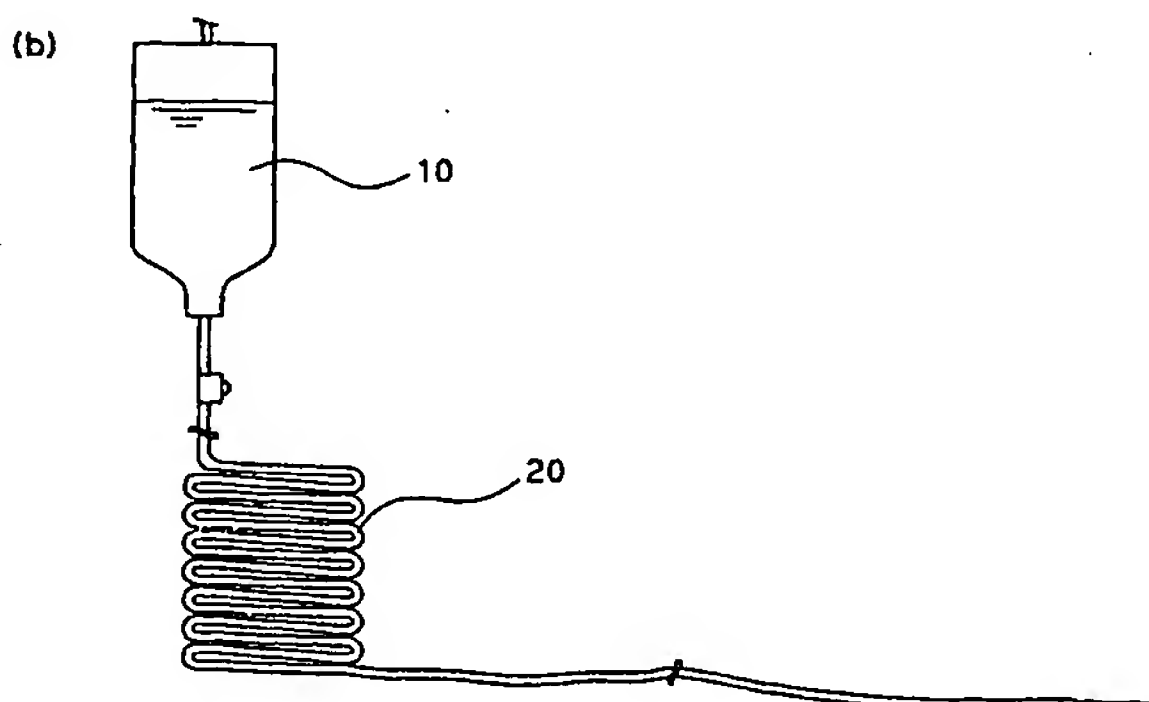
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(54) Title: LIQUID SUPPLYING SYSTEM AND METHOD OF HEATING THE LIQUID IN THE SYSTEM



(57) Abstract: The present invention relates to a medical liquid supplying system, and more particularly, to a liquid supplying system and a method of heating a liquid using the system, wherein when a patient who undergoes an operation or is in the hospital is supplied with blood, a nutrient liquid or the other liquids, the liquid can be more economically and conveniently supplied at a temperature similar to the patient's temperature. The liquid supplying system according to the present invention comprises a liquid storage container, a liquid supply tube, a liquid injection unit, and a heater. In the liquid supplying system, the liquid is supplied in a state where the heater is in contact with the liquid storage container or a portion of the liquid supply tube that is rolled up in a plurality of turns or folded over and over again.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

LIQUID SUPPLYING SYSTEM AND METHOD OF HEATING THE LIQUID IN THE SYSTEM

Technical Field

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The present invention relates to a medical liquid supplying system, and more particularly, to a liquid supplying system and a method of heating a liquid using the aforementioned system, whereby a patient who undergoes an operation or whilst in the hospital is supplied with blood, a nutrient liquid or any other liquids, the liquid can be more economically and conveniently supplied at a temperature similar to that of the patient's.

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Background Art

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Generally, liquids such as an ordinary medical liquid, blood or a nutrient liquid is injected into a patient as it is at room temperature. However, in cases where a surgical patient is in a serious condition, the patient may be physiologically damaged when the liquid is supplied to the human body as it is at room temperature. In order to prevent such a situation, it is required that the liquid be supplied at a temperature similar to that of the patient's. Several methods for realizing this requirement have been proposed.

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As an example, a method exists of mounting a fine hot wire longitudinally along the entire liquid supply tube which extends from a liquid storage container to a portion of the patient's body. Although this method allows the liquid to be efficiently heated, there is a disadvantage in that the manufacturing costs of the tube are increased.

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Another example is a method of placing a heater in the middle of a liquid supply tube and then passing the liquid through the heater so that the temperature of the liquid to be supplied to the human body may be increased. However, this method does not sufficiently raise the temperature of the liquid since the period of time during which the liquid passes through the heater is relatively short.

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Therefore, a system for allowing a liquid to be more economically, easily and efficiently heated up to an appropriate temperature, and a method of heating the liquid using this system has been studied and explored.

5 **Summary of the Invention**

The present invention is conceived to overcome the disadvantages of the conventional liquid supplying system. An object of the present invention is to provide a new liquid supplying system for allowing a liquid to be more economically and conveniently supplied at a temperature similar to the patient's temperature.

Another object of the present invention is to provide a method of economically and easily heating a liquid up to a temperature similar to a patient's temperature.

In order to accomplish the above objects, according to a first aspect of the present invention, there is provided a liquid supplying system, including a liquid storage container, a liquid supply tube and a liquid injection unit, and further comprising a heater, wherein a liquid is supplied in a state where the heater is in contact with the liquid storage container or a portion of the liquid supply tube that is rolled up in a plurality of turns or folded over and over again.

As disclosed in the above constitution, according to the present invention, there is provided a new liquid supplying system for allowing the temperature of the liquid to be supplied to a patient to be raised, by contacting the liquid storage container, such as a bottle or a plastic bag, with the heater, or by rolling up a portion of the liquid supply tube in the plurality of turns or folding it over and over again and then contacting the portion of the liquid supply tube with the heater.

The liquid supplying system constructed by contacting the liquid storage container with the heater may include liquid supplying systems such as those constructed by wrapping up the liquid storage container, preferably, in a sheet type heater, or in a bag type heater for enclosing the entire liquid storage container.

Furthermore, the liquid supplying system constructed by contacting a portion of the liquid supply tube, which has been rolled up in the plurality of turns or folded over

and over again, with the heater may include various types of liquid supplying systems as follows:

First, there may be provided a liquid supplying system, wherein the folded or rolled up portion of the tube is put on the heater. That is, there may be provided a liquid supplying system, wherein the liquid storage container usually suspends at a position higher than a predetermined height and the tube extending downward from a liquid discharging port at the bottom of the liquid storage container so as to supply the liquid to the patient is put on the heater in a state where it is rolled up in the plurality of turns or folded over and over again, preferably, in the middle of the tube.

Second, there may be provided a liquid supplying system, wherein the liquid supply tube is wound around a predetermined type of heater in the plurality of turns. For example, there may be provided a liquid supplying system, wherein the tube is wound around a water bottle, preferably containing hot water, in the plurality of turns.

Third, there may be provided a liquid supplying system, wherein the rolled up or folded portion of the tube is wrapped up in the heater. At this time, the heater is preferably of a sheet type so as to wrap up the portion of the tube that has been rolled up in the plurality of turns or folded over and over again.

Fourth, there may be provided a liquid supplying system, wherein the rolled up or folded portion of the tube is immersed in a water tank containing hot water.

In addition to the above exemplified types, several types of liquid supplying systems constructed by rolling up a portion of the liquid supply tube in a plurality of turns or folding it over and over again and then contacting the rolled up or folded portion of the tube with a heater in various manners may be manufactured according to the present invention.

It is preferable that the heater, which can be used in the liquid supplying system of the present invention, be of a type of heater such as a water tank or water bottle containing hot water, or a sheet type heater containing hot water or other heating elements, depending on the constitution of the present invention. However, the heater is not limited thereto. So long as the liquid can be heated in the range of a temperature similar to that of the human body, i.e. 20 to 35 °C, in accordance with the respective

object during a predetermined period of time, any type of heaters can be sufficiently used.

In the above situations, the alternative heating elements for constituting the heater may include chemical substances contained within a portable heater, usually known as a pocket warmer. The chemical substances may include a mixture of high-purity iron powder, salt and active carbon which generates heat while being oxidized by the combination with oxygen, and sodium acetate which generates latent heat while being crystallized. The chemical substances can keep a predetermined temperature during a predetermined period of time owing to their chemical reactions. Thus, if a portion of the liquid storage container or the liquid supply tube of the liquid supplying system according to the present invention is contacted with various types of heaters containing these chemical substances for the period of time during which the liquid should be supplied, the liquid can be supplied in the predetermined range of temperature during any given period of time.

The liquid supplying system of the present invention may further include a liquid supplying system constructed by wrapping up the liquid storage container in the heater, and at the same time, contacting the portion of the tube, which has been rolled up in the plurality of turns or folded over and over again, with the heater.

That is, as described above, there may be provided the liquid supplying system constructed by contacting the portion of the tube, which has been rolled up in the plurality of turns or folded over and over again, with the heater in various manners, and at the same time, wrapping up the liquid storage container in the heater. Thus, by heating both the liquid supply tube and the liquid storage container of the liquid supplying system or by keeping them warm, the heating efficiency of the liquid can be increased. At this time, although the heater contacting with the liquid supply tube may be one of any types of heaters as described above, the heater wrapping up the liquid storage container would preferably be a sheet or bag type heater containing hot water or another heating element.

According to a second aspect of the present invention, there is provided a method of heating a liquid within a liquid supplying system of the present invention

using the system.

That is, there is provided a method of heating a liquid within a liquid supply system, wherein in the liquid supplying system comprising a liquid storage container, a liquid supply tube and a liquid injection unit, a portion of the liquid supply tube is rolled up in a plurality of turns or overlappingly folded over and over again and the rolled up or folded portion comes into contact with a heater, the liquid storage container comes into contact with the heater, or both the rolled up or folded portion of the tube and the liquid storage container come into contact with the heater, respectively.

The above method of the present invention in which the portion of the liquid supply tube is rolled up in the plurality of turns or overlappingly folded over and over again and then the rolled up or folded portion comes into contact with the heater is characterized in that when compared with a conventional method of disposing a heater in the middle of a liquid supply tube in a conventional liquid supplying system, a contact area of the liquid supply tube with the heater can become larger, and thus, the temperature of the liquid contained within the tube can be more efficiently raised.

Furthermore, according to the present invention, the temperature of the liquid may be raised simply by wrapping only the liquid storage container in the heater.

The manner of contacting the portion of the tube, which has been rolled up in the plurality of turns or folded over and over again, with the heater in the above method corresponds to one of the various manners of contacting the portion of the tube with the heater in the liquid supplying system according to the first aspect of the present invention. That is, the above method may employ the manner of putting the portion of the tube, which has been rolled up in the plurality of turns or folded over and over again, on the heater; winding the tube around the heater; or wrapping up the portion of the tube, which has been rolled up in the plurality of turns or folded over and over again, in a sheet or the like containing the heating elements.

In the meantime, although the temperature of the liquid to be supplied to the patient's body varies depending on the patient's status, the kinds of medical liquids to be used, etc., the temperature of the heater can be controlled so as to keep the temperature of the liquid in the patient's temperature range of approximately 20 to 35 °C.

Brief Description of the Drawings

FIGS. 1 (a) and 1 (b) are schematic views of a liquid supplying system according to an embodiment of the present invention, with a portion of a liquid supply tube of the system rolled up in a plurality of turns or folded in a zigzag form.

FIG. 2 is a schematic view of a liquid supplying system according to another embodiment of the present invention, with a liquid storage container of the system wrapped up in a sheet type heater.

FIG. 3 is a schematic view of a liquid supplying system according to a further embodiment of the present invention, which is constructed by winding a portion of the liquid supply tube of the system around a water bottle containing hot water in a plurality of turns.

FIG. 4 is a schematic view of a liquid supplying system according to a further embodiment of the present invention, with a portion of the liquid supply tube of the system folded over and over again and wrapped up in a heating sheet, and at the same time with a liquid storage container of the system wrapped up in another heating sheet.

Detailed Description of the Embodiments

Hereinafter, the constitutions of liquid supplying systems according to the present invention will be explained with reference to the accompanying drawings.

FIGS. 1 (a) and 1 (b) are views schematically showing a liquid supplying system according to the present invention, with a portion of the liquid supply tube 20 of the system rolled up in a plurality of turns or folded in a zigzag form.

FIG. 2 is a view schematically showing a liquid supplying system according to the present invention, with the liquid storage container 10 of the system wrapped up in a sheet type heater 30.

FIG. 3 is a view schematically showing a liquid supplying system according to the present invention, with a portion of the liquid supply tube 20 of the system wound around a water bottle 30 containing hot water in a plurality of turns.

FIG. 4 is a view schematically showing a liquid supplying system according to the present invention, with the portion of the liquid supply tube 20 of the system folded over and over again and wrapped up in a heating sheet 30a, and at the same time, with the liquid storage container 10 of the system wrapped up in another heating sheet 30b.

5 As shown in FIGS. 1 (a) and (b), the liquid supplying system of the present invention allows the temperature of a liquid to be more efficiently raised, by rolling up the portion of the liquid supply tube 20 in the plurality of turns or folding it over and over again so that the period of time during which the liquid passing through the tube is in indirect contact with the heater can be lengthened.

10 As shown in FIG. 2, the liquid supplying system of the present invention may be constructed simply by wrapping up the liquid storage container 10 in a sheet or bag type heater 30 containing either hot water or chemical heating elements.

As shown in FIG. 3, by winding the liquid supply tube of the liquid supplying system according to the present invention around the heater taking a predetermined shape, the wound tube is hardly deformed in shape, making its use more convenient.

15 As shown in FIG. 4, by contacting the folded or rolled up portion of the tube with the heater and at the same time, wrapping up the liquid storage container in the heater, the temperature of the liquid can be more efficiently raised.

The above liquid supplying system according to the present invention should not be limited to the above forms presented as specific examples. Accordingly, it will be understood by a person with an ordinary skill in the art that various modifications and changes may be made to the present invention without departing from the spirit and scope of the invention defined by the appended claims. It is apparent that these modifications and changes fall within to the scope of the present invention.

20 With this liquid supplying system and method of heating the liquid according to the present invention, the liquid can be more efficiently raised to a temperature similar to that of the human body and can then be supplied to the human body by means of a simple constitution and method. Furthermore, this system and method is extremely economical.

CLAIMS

1. An improved liquid supplying system including a liquid storage container, a liquid supply tube and a liquid injection unit, the improvement comprising:

5 a heater,

wherein a liquid is supplied in a state where the heater is in contact with the liquid storage container or a portion of the liquid supply tube that has been rolled up in a plurality of turns or folded over and over again.

10 2. The system as claimed in claim 1, wherein the liquid storage container is wrapped up in the heater.

3. The system as claimed in claim 1, wherein the liquid is supplied in a state where the rolled up or folded portion of the liquid supply tube is put on the heater.

15 4. The system as claimed in claim 1, wherein the rolled up or folded portion of the liquid supply tube is wrapped up in the heater.

20 5. The system as claimed in claim 1, wherein the portion of the liquid supply tube is wound around the heater.

6. An improved liquid supplying system including a liquid storage container, a liquid supply tube and a liquid injection unit, the improvement comprising:

a heater,

25 wherein the liquid is supplied in a state where the heater is in contact with both the liquid storage container and a portion of the liquid supply tube that has been rolled up in a plurality of turns or folded over and over again.

30 7. The system as claimed in any one of claims 1 to 6, wherein the heater is a water bottle type of heater containing hot water, or a sheet or bag type heater containing hot

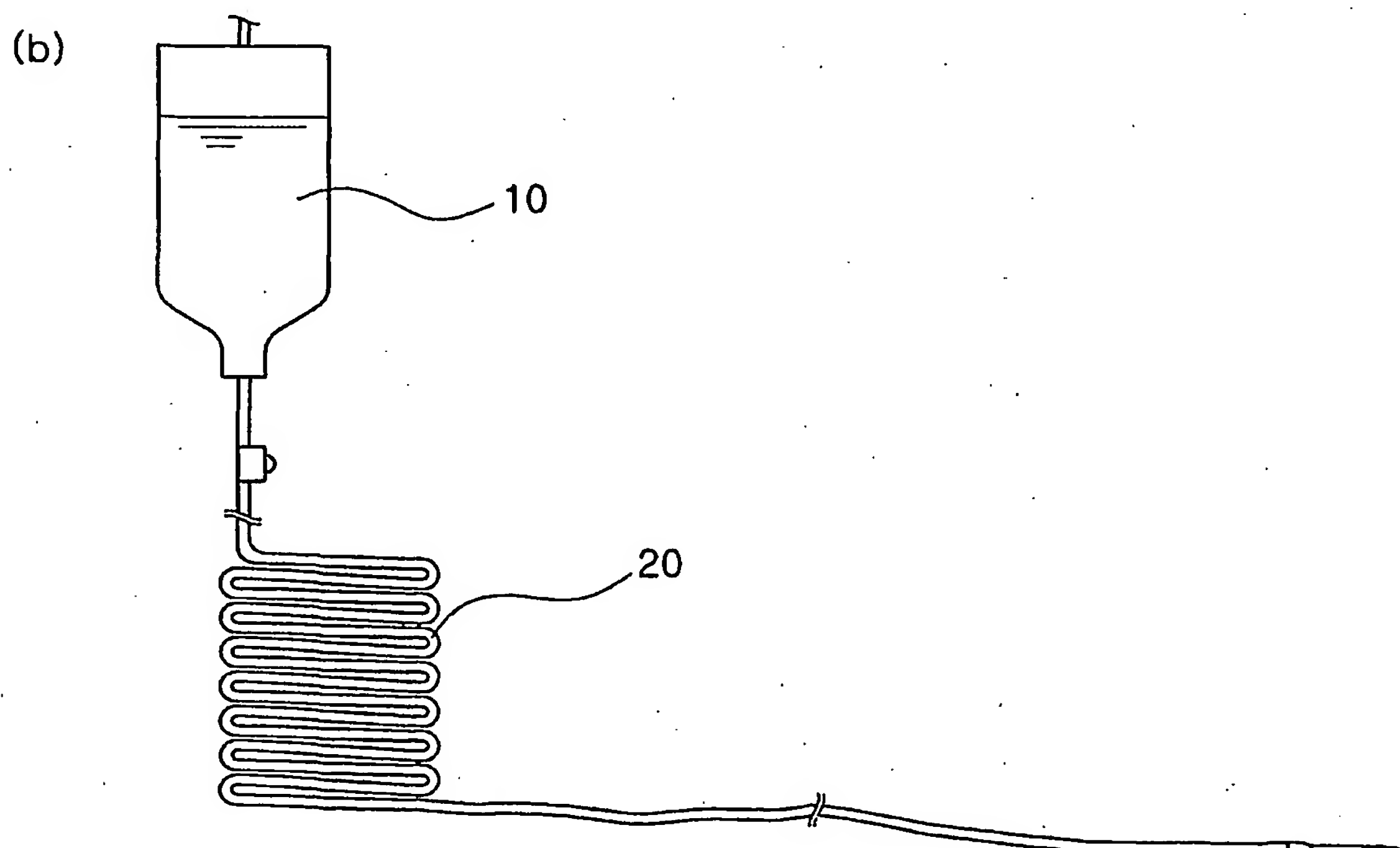
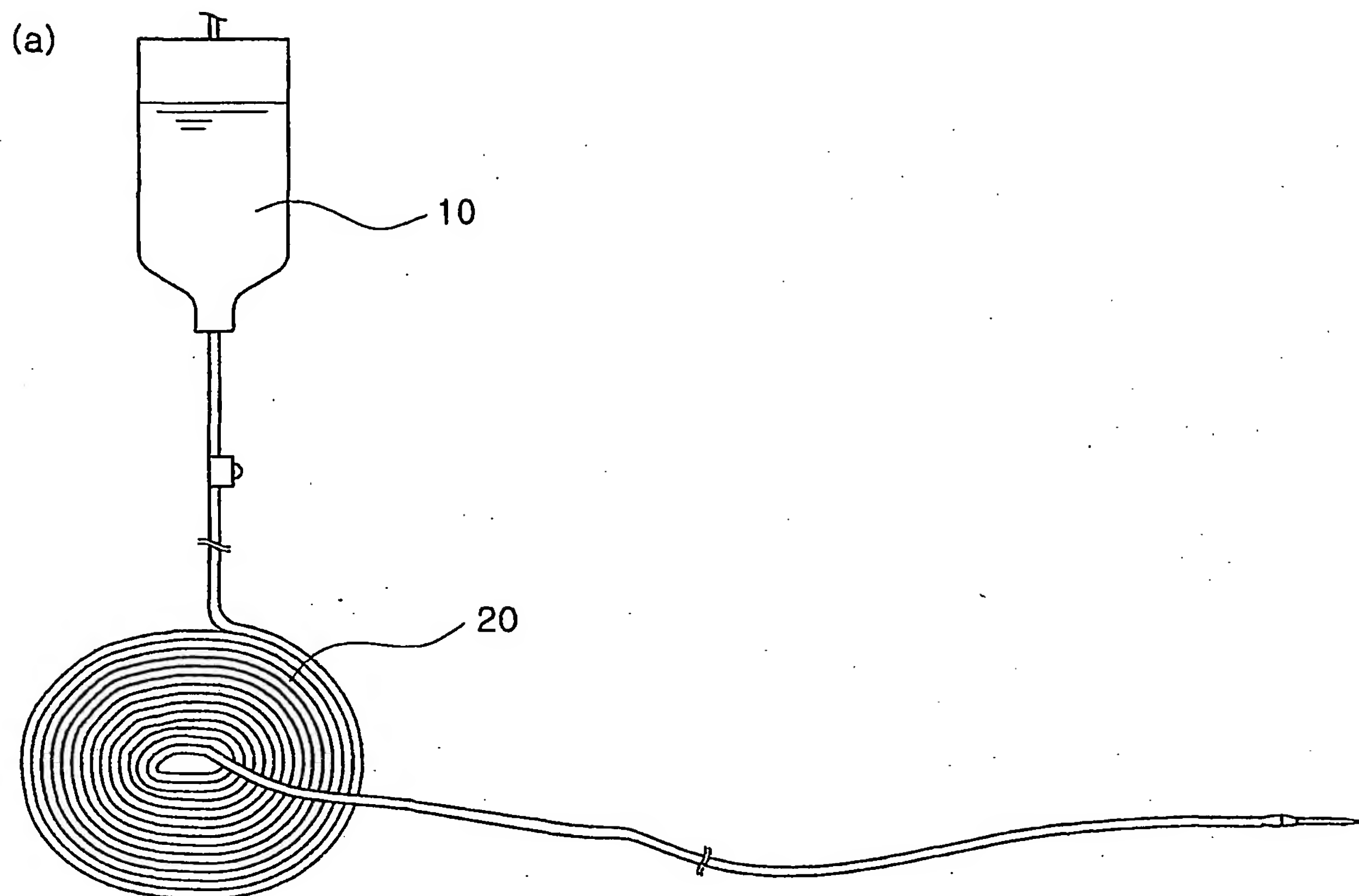
water or a chemical heating element.

8. The system as claimed in claim 2 or 4, wherein the heater is a sheet or bag type heater containing hot water or a chemical heating element.

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9. A method of heating a liquid contained within the liquid supplying system as claimed in any one of claims 1 to 6 using the system.

Fig.1



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Fig.2

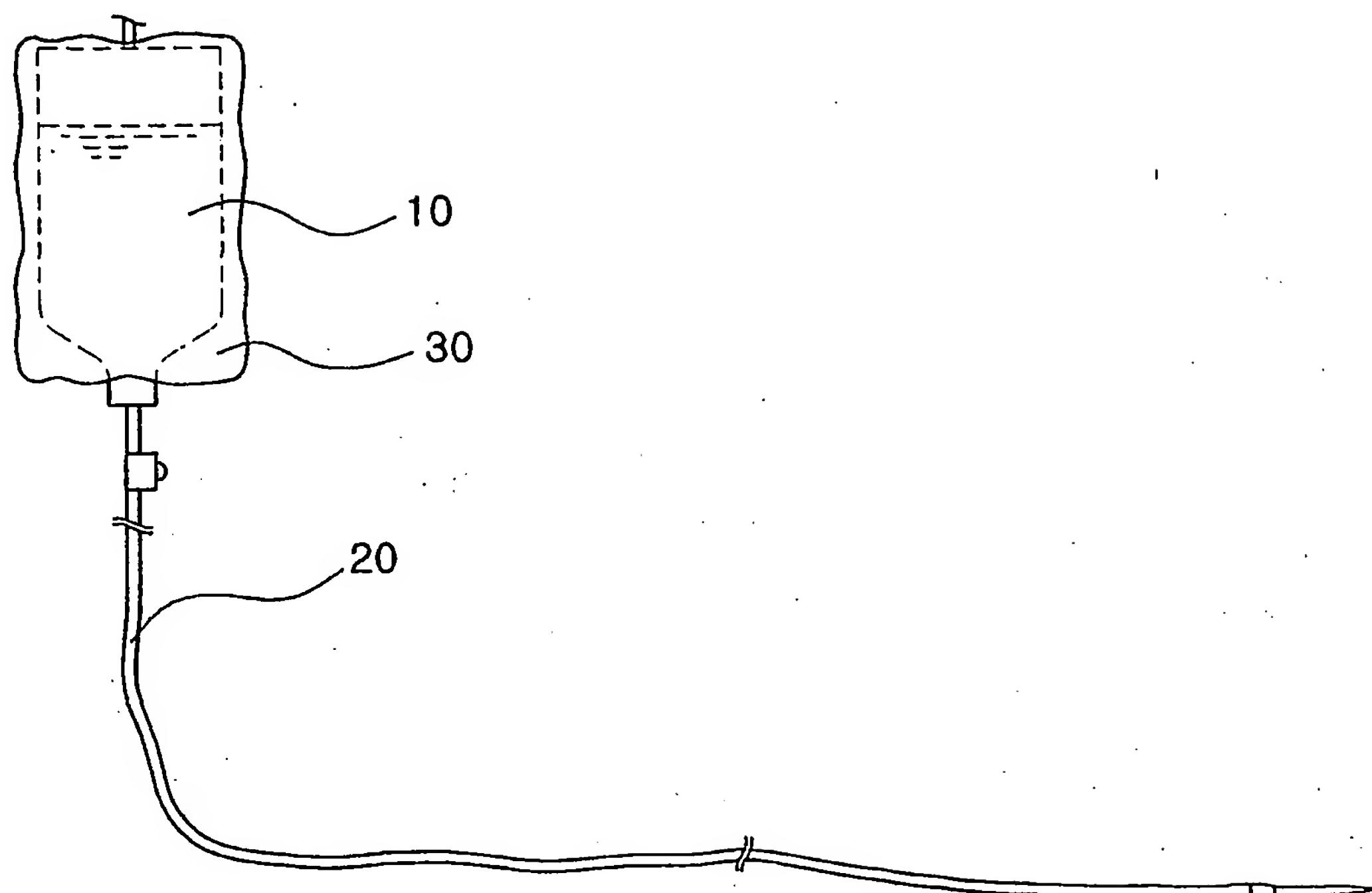


Fig.3

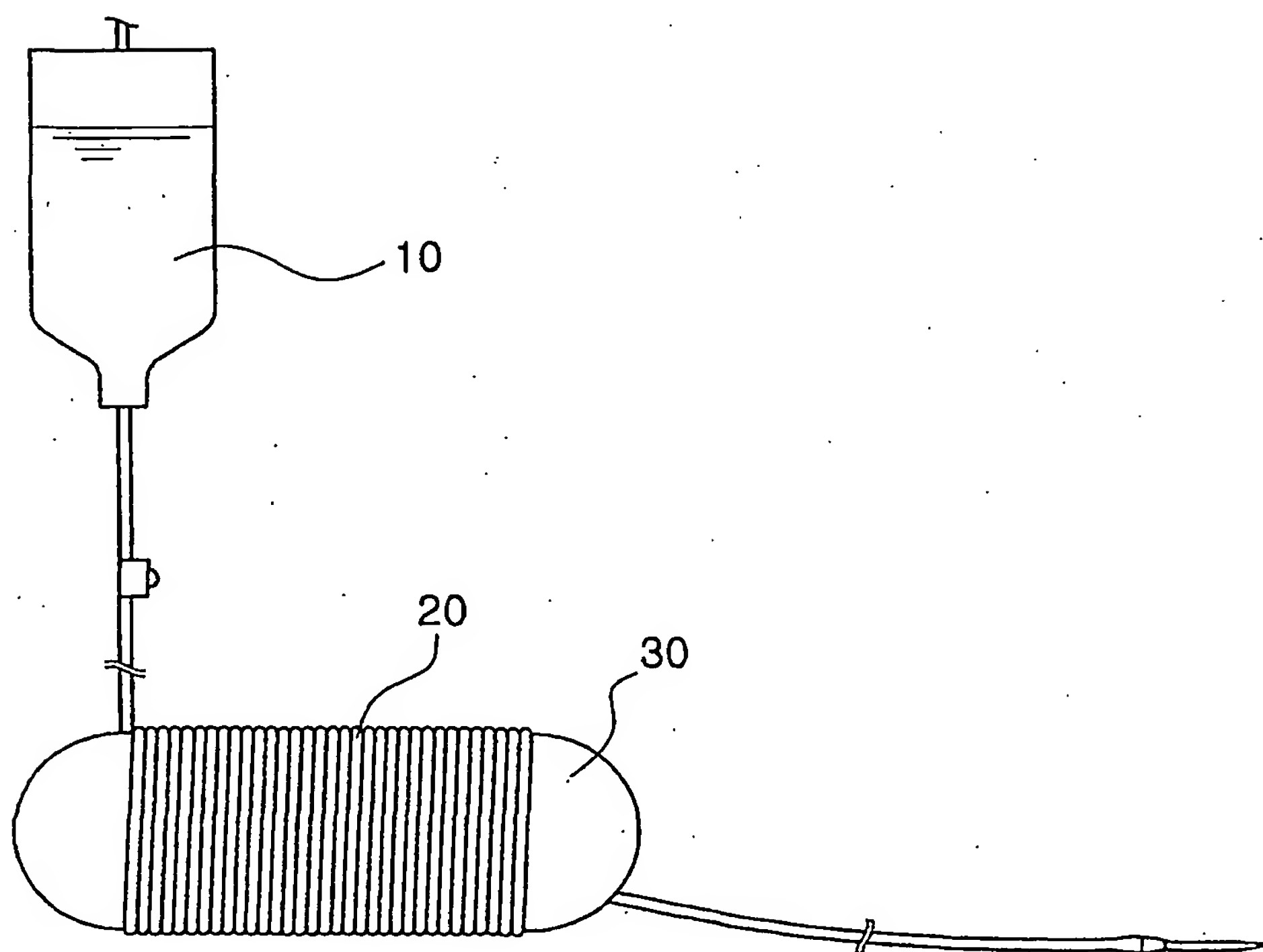
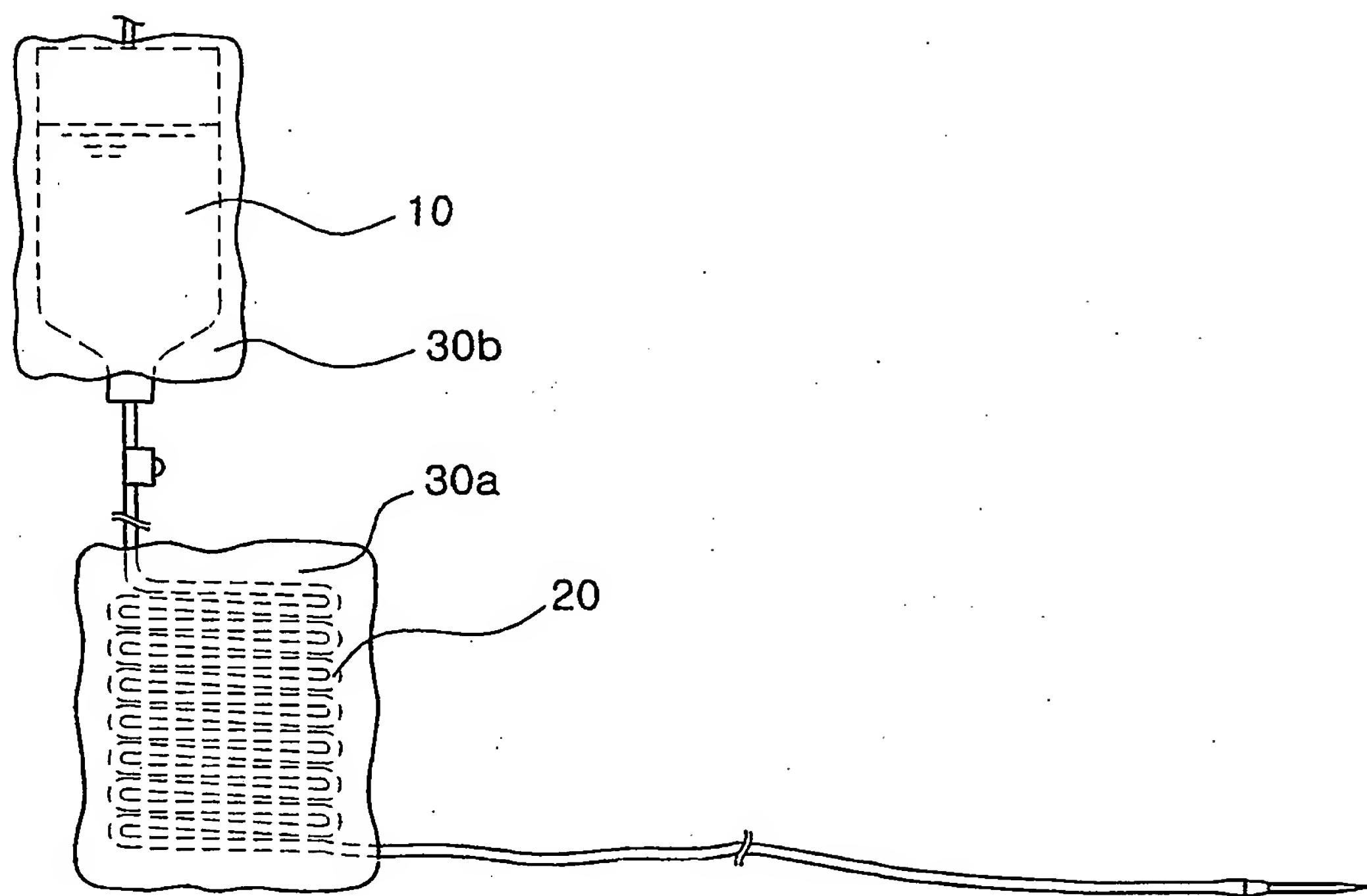


Fig.4



INTERNATIONAL SEARCH REPORT

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PAJ, KIPASS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5474538 A (STIHLER ELECTRONIC MEDIZINISCH) 12 December 1995	1, 5, 9 6
X Y	WO 92/02267 A (NIELSEN PETER; STRANDLEIF) 20 February 1992	1, 2, 9 6
X Y	US 4709135 A (STIHLER MEDIZINTECHNIK GMBH) 24 November 1987	1, 5, 9 6
X Y	DE 4328321 A (BARKEY VOLKER) 2 March 1995	1, 2, 9 6
X Y	US 4772778 A (OGAWA GENSHIRO) 20 September 1988	1, 3, 9 6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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